Aviation Investigation Final Report

Location:	New York, New York	**Accident Number:**	ERA10LA118
Date & Time:	January 18, 2010, 17:33 Local	**Registration:**	N696BH
Aircraft:	Eurocopter AS 350 B2	**Aircraft Damage:**	Substantial
Defining Event:	Sys/Comp malf/fail (non-power)	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

Shortly after takeoff, the pilot of the helicopter reported feeling a vibration through the airframe including the anti-torque pedals and cyclic. With positive control of the helicopter, he safely landed at a nearby heliport. After touchdown, while shutting down and applying the rotor brake, he noted that the vibration increased dramatically as the rotor speed decreased to a stop. Upon a cursory inspection of the helicopter after shutdown, the pilot noticed that one pitch change link of one tail rotor blade was separated from its respective attach point at the blade, and the blade was out of its normally installed position. Further inspection revealed a hole in the right side of the tailboom and the tailcone was damaged consistent with the tail rotor blade contacting the tailboom. The securing hardware (consisting of the bolt, castellated nut, and cotter pin) of the separated pitch change link were not found. The opposite tail rotor blade pitch change link was found properly connected at both ends, with both ends secured by cotter pins. Inspection of the tail rotor assembly by the Safety Board's Materials Laboratory revealed no evidence indicating that the missing bolt had fractured or was properly installed and secured with a cotter pin.

Several days before the accident a mechanic had inspected the tail rotor pitch change links of the helicopter for end play and he was advised by the company's Director of Maintenance that the bearing of the tail rotor pitch change spider assembly needed to be replaced. The mechanic stopped his inspection and the work to the tail rotor pitch change spider assembly was completed the next morning at which point the tail rotor assembly was installed. There was no record of a post-maintenance inspection of the replaced pitch change link assembly at the tail rotor blade attach point. Additionally, the operator at the time did not have a Required Inspection Items (RII) program on their Federal Aviation Administration Approved Aircraft Inspection Program, and if they had, it is likely that a RII inspection by a trained mechanic would have detected the missing cotter pin upon completion of the replacement maintenance

performed on the pitch change link assembly. Following the accident, the operator implemented a Lockout/Tagout procedure to ensure its aircraft are not returned to service before the RII program is completed.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The failure of maintenance personnel to properly secure one tail rotor pitch change link to its respective tail rotor blade resulting in an in-flight separation of the link from the blade. Contributing to the accident was the lack of an adequate post-maintenance inspection procedure.

Findings

Aircraft	Tail rotor blade - Incorrect service/maintenance
Organizational issues	Adequacy of policy/proc - Operator

Factual Information

History of Flight

Enroute-cruise	Sys/Comp malf/fail (non-power) (Defining event)

On January 18, 2010, about 1733 eastern standard time, a Eurocopter AS 350 B2, N696BH, registered to Broadcast Helicopter Corporation and operated by Liberty Helicopters, Inc., experienced an in-flight vibration about 4 minutes after takeoff and landed at the West 30th Street Heliport (JRA), New York, New York. Visual meteorological conditions prevailed and company VFR flight following was in effect for the positioning flight operating under the provisions of 14 Code of Federal Regulations (CFR) Part 91. The helicopter was substantially damaged and the commercial pilot, who was the sole occupant, was not injured. The flight originated from the Downtown Manhattan/Wall Street Heliport (JRB), New York, New York, at 1729, and was enroute to JRA.

The pilot stated that during cruise flight while flying at 600 feet, he announced his intent to land at JRA, and was cleared to land on spot 3 of the heliport behind another aircraft that was approaching from the north. At that time he felt a vibration which he could feel through the airframe including the anti-torque pedals and cyclic. The pilot further stated that he had positive control of the helicopter and felt the safest thing to do was continue with the landing. The vibration remained constant and during the approach he maintained control of the helicopter. After touchdown on spot 3 he immediately began to shutdown the helicopter and applied the rotor brake. The vibration increased dramatically as the rotor speed decreased. After the main and tail rotors stopped, the pilot exited the helicopter and noticed damage to the tail rotor and the surrounding area. One pitch change link of one tail rotor blade was separated fromits attach point at the blade and the blade was out of its normally installed position.

During postaccident inspection of the helicopter by representatives of the Federal Aviation Administration (FAA) and Liberty Helicopters, Inc., a hole was found in the right side of the tailboom near station 3700, and the tailcone was damaged near station 4880.6. The pitch change link of one tail rotor blade was found not connected to the blade control horn, and the securing hardware link, consisting of the bolt, castellated nut, and cotter pin were not found. The opposite end of the link remained attached to the pitch change spider assembly, and was secured by a cotter pin. The tail rotor blade with the separated pitch change link exhibited paint transfer marks on the leading edge of the blade near the blade tip consistent with the color of the tailboom. The same area of the blade tip showed abrasion on it’s leading edge. No dents in the area of the paint transfer marks were observed. The other tail rotor blade pitch change link was found properly connected at both ends, with both ends secured by cotter pins. The tail rotor was retained for further examination.

Review of the maintenance records showed an annotation that on January 11, 2010, the tail rotor pitch change spider bearing was removed and replaced because it was a service life limited item. The bearing installation procedure required the removal of the tail rotor assembly which required removal of the pitch change links. After the maintenance was performed, the helicopter was test flown and approved for return to service on January 16, 2010. The helicopter was not operated in revenue service on January 17, 2010, but on the accident date, including the accident flight, was operated a total of 4 flights lasting a total of 39 minutes.

One mechanic stated that on January 11th, he elected to work on the tail rotor section and noticed unusual play on one of the tail rotor pitch change links. When his inspection of it was completed, the company director of maintenance informed him that the bearing of the tail rotor pitch change spider needed to be replaced because it was a life limited item. The mechanic secured the pitch link he had previously removed from the tail rotor blade and tightened the hardware in an effort to avoid losing any parts. He then removed the tail rotor assembly and provided a turn over briefing advising maintenance personnel of what he had done. The following day, the tail rotor assembly was installed and one mechanic reported inspecting the pitch change links at the tail rotor pitch change spider and confirmed both were secure with cotter pins. He also inspected the tail rotor through bolt for proper security but did not mention checking the security of the pitch links at either tail rotor blade.

Detailed examinations of the tail rotor assembly by the Safety Board's Materials Laboratory did not disclose mechanical evidence that the missing bolt that would have secured the pitch change link was properly installed and secured with a cotter pin. A factual report (Materials Laboratory Factual Report No. 10-048) describing the detailed examination of the tail rotor assembly components is available in the public docket of supporting documentation for this accident investigation.

The helicopter was maintained in accordance with a FAA Approved Aircraft Inspection Program. The inspection program at that time did not include, nor was it required to include required inspection items for a quality control inspection following maintenance or repair of critical safety of flight items.

Pilot Information

Certificate:	Commercial	**Age:**	35,Male
Airplane Rating(s):	None	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	July 16, 2009
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	September 21, 2009
Flight Time:	2012 hours (Total, all aircraft), 314 hours (Total, this make and model), 1957 hours (Pilot In Command, all aircraft), 151 hours (Last 90 days, all aircraft), 47 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Eurocopter	**Registration:**	N696BH
Model/Series:	AS 350 B2	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	3793
Landing Gear Type:	Skid	**Seats:**	6
Date/Type of Last Inspection:	January 16, 2010 AAIP	**Certified Max Gross Wt.:**	4961 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo shaft
Airframe Total Time:	5957 Hrs as of last inspection	**Engine Manufacturer:**	TURBOMECA
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	ARRIEL 1D1
Registered Owner:	BROADCAST HELICOPTER CORP	**Rated Power:**	650 Horsepower
Operator:	Liberty Helicopters, Inc.	**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:		**Operator Designator Code:**	MHIA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Dusk
Observation Facility, Elevation:	NYC	**Distance from Accident Site:**	
Observation Time:	17:51 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 3800 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.87 inches Hg	**Temperature/Dew Point:**	8°C / 1°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	New York, NY (JRB)	**Type of Flight Plan Filed:**	Company VFR
Destination:	New York, NY (JRA)	**Type of Clearance:**	None
Departure Time:	17:29 Local	**Type of Airspace:**	

Airport Information

Airport:	West 30th Street Heliport JRA	**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Precautionary landing

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	40.754444,-74.006942(est)

Administrative Information

Investigator In Charge (IIC):	Monville, Timothy
Additional Participating Persons:	Nicholas Gregoriades; FAA/FSDO; Farmingdale, NY Bernard Boudaille; Bureau d'Enquetes et d' Analyses; Le Bourget Michel Martin; Eurocopter; Marignane
Original Publish Date:	June 13, 2011
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=75281